Contextualized Science Learning: a methodological proposal

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1 - INTRODUCTION OF THE TOPIC

Science education should aim at developing citizens' scientific literacy, as well as at making students aware of the relevance of science for their daily lives.

However, students' motivation to learn science at school is usually low partly because they do not perceive the relevance of science knowledge for daily life stings.

Science teaching for contextualized science learning is expected to:

- Focus on themes and concepts that are required to understand students' daily life issues;
- Pay special attention to the students' (social, cultural, geographic and environmental) setting;
- Help students to make a bridge between science knowledge and their everyday knowledge.

2 - AIM OF STUDY

This paper aims at presenting a methodological proposal for contextualized science learning which takes into account the strengths of the main approaches available in the literature and avoids their shortcomings.

3 - THEORETICAL FRAMEWORK

Contextualized learning has to do with learning new knowledge from real contexts, working *with* and *on* them, through active and student centered methodologies.

So far a few contextualized learning approaches were reported in the literature. They include problem-based learning, inquiry-based learning, REACT, project-based learning and 5E's.

All these approaches have educational potential but they also bear some shortcomings, which are often highlighted by the authors themselves.

Description of former contextualized learning approaches

Approach	Description
Problem-based learning (PBL)	Students develop competencies and learn new knowledge by solving problems. Before a problem raised in a real context, students become aware of what they already know, identify what they need to know and decide on what they need to do in order to solve the problem. Then, they solve it and share their learning with their classmates. Finally, they do self- and hetero-assessment, as well as process evaluation. [1]
Inquiry-based learning (IBL)	Students learn knew knowledge by engaging into scientifically oriented issues and solving related question based on evidences gathered in a planed and systematic way. Afterwards, they evaluate the solutions reached and share them with their classmates. [2]
REACT	Students should learn new knowledge working within a dally life context, according to the principles of **R**elating, **E**xperiencing, **A**pplying, **C**ooperating and **T**ransferring. [3]
Project-based learning (ProjBL)	Students develop a competencies and learn new knowledge by undertaking projects related to issues that they can face in the real world. [4] Students engage in a constructive investigation which can be conceptualized as a goal directed process that involves inquiry, knowledge building, and resolution.
5E's	This is a problem oriented or a Project oriented or question oriented approach. Students **e**ngage and **e**xplore a topic, are given an **e**xplanation for their **e**xperiences, elaborated on what they have learned, and **e**valuated. [5]

Strengths

- Learning starts with a problem to be solved without knowledge conveyed by the teacher (PBL)
- Familiar situations are related with new information and problems to be solved (REACT)
- New knowledge is applied and transferred to unfamiliar and real world situations (REACT)
- Learning takes place by doing (PBL; ProjBL; REACT)
- New knowledge is applied to real world tasks (ProjBL)
- Critical reflection on inquiry processes and products of learning is fostered (IBL; PBL)
- Teacher input (during the learning process) facilitates students' learning job (5E's; REACT)
- Newly acquired knowledge is integrated with prior knowledge (5E's; REACT; PBL)
- Knowledge is shared with peers and others (all approaches)

Shortcomings

- The absence of evaluation of the learning process (5E's; ProjBL; REACT; IBL)
- The lack of synthesis of newly acquired knowledge (5E's; ProjBL; REACT; IBL)
- The absence of the self or/and peer evaluation (5E's; REACT; IBL)
- Use of non-real contexts (5E's; IBL)
- Students are not asked to define the problem-solving strategies (IBL; ProjBL; 5E's)

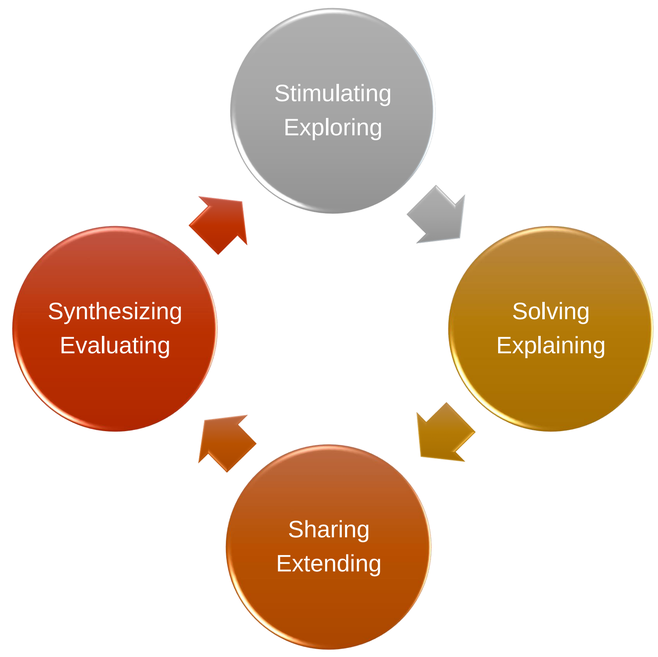
4 – METHODOLOGICAL PROPOSAL

The proposal was given the acronym 4SE as it includes eight steps as follows: **S**timulating, **E**xploring, **S**olving, **E**xplaining, **S**haring, **E**xtending, **S**ynthesizing and **E**valuating.

For its development attention was paid to the strengths and weaknesses of a few former contextualized learning approaches described in the literature [1, 2, 3, 4, 5] to avoid their shortcomings

It acknowledges Gilbert's concept of context as the social circumstances, assumes a social constructivist perspective of teaching and learning and draws heavily on situated learning, as well as on the theory of activity [6].

- **Social constructivist perspective**
  - Learning is student cantered
  - Student cognitive development depends on his/her social and cultural environment
- **Situated learning**
  - students and teachers develop their identity through productive interactions within particular settings
  - nature of the physical, social, and psychological environment of the students governs the quality of learning that takes place
- **Theory of activity**
  - The learner enters into a "cognitive apprenticeship" with the teacher who is an expert in interpreting the setting (the focal event)
  - The learner and the object being studied mutually define each other due to the human activity on/with the object.



The 4SE's approach

Stimulating | Engage with the context, so that it becomes meaningful
Exploring | Develop some willingness to explore the context

Solving | Plan an inquiry and put it into practice to find answers for the issues that emerge from the context
Explaining | Organize and interpret the information collected

Sharing | Share the newly acquired knowledge with their teacher and peers
Extending | Apply newly knowledge in the new situations

Synthesizing | Summarize the acquired knowledge
Evaluating | Auto and Hetero-evaluate, as well as evaluate the teaching and learning process

5 – CONCLUDING REMARKS

It is our belief that putting 4SE in practice a challenging and demanding task for teachers.

We acknowledge the idea that the success of any educational methodology depends heavily on the quality of the engagement of the participants in the teaching and the learning processes.

Hence,

- teacher training is needed before teachers can put this approach into practice;
- students need to either be used to or learn how to work cooperatively before engaging in 4SE;
- classrooms should become students centered learning environments.

If implementation results are positive, teacher educators should train prospective teachers to use 4SE in their future schools and to provide in service training to in-service teachers.

6 - Bibliography

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